IGNEOUS

objective: 3240-0503
Igneous rocks make up 95% of the rocks of the crust of the earth. They are also some of the oldest rocks that are found at the surface of the earth. Igneous rocks are classed on the basis of where they form and the compostion of the molten rock. Igneous rocks form from molten rock which is either ejected at the surface of the earth or cools off underground. When volcanoes erupt, they can eject molten rock as shown in the following picture.

This hot, thick lava flows down the side of the volcano and eventually cools. Once is has cooled, it is an **extrusive igneous** rock. **EXTRUSIVE IGNEOUS ROCKS Extrusive** igneous rock forms when molten rock reaches the earth's surface and cools. Air and moisture cool the lava rapidly. The quick cooling doesn't allow the formation of large crystals so most extrusive rocks have small crystals or none at all. In some extrusive rocks, like pumice and scoria, air and other gases are trapped in the lava as it cools. We can see holes left in the rock where the bubbles of gas were located.

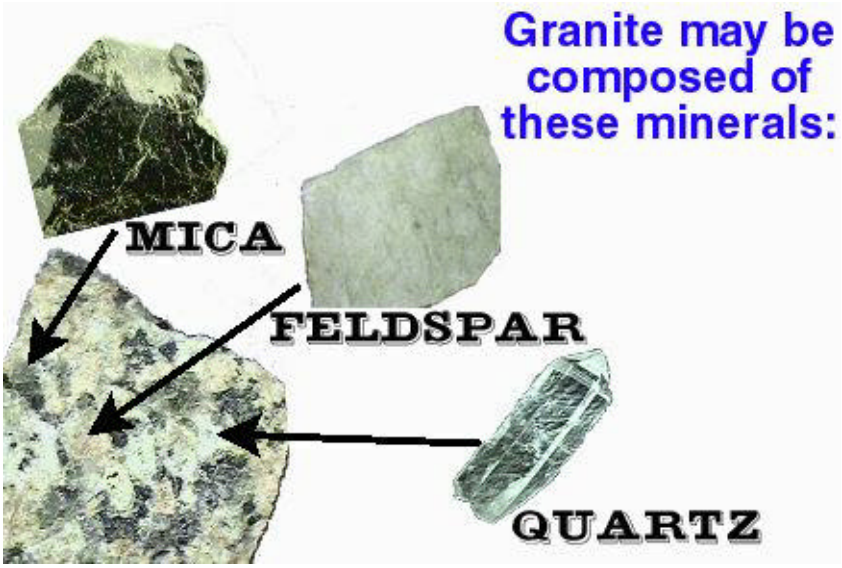
The most common extrusive rock is basalt. **Basalt** froms from basaltic lava is heavy, dark-colored, dense lava. Basaltic lava is dark because it contains high amounts of iron and magnesium. The black beaches of Hawaii are formed from eroded basalt.basalt.

Another kind of intrusive rock is **pumice** which forms from granitic lava**.** This kind of lava is lighter colored, less dense and composed of silicon and oxygen. Pumice cools off very quickly and also is associated with gaseous eruptions. Therefore, pumice is very lightweight, and has very small crystals. Some pumice will float in water.

Obsidian is also formed from granitic lava**.** If granitic lava is light colored, then why is obsidian sometimes black in color? Obsidian cools so rapidly that it has no crystals. Obsidian is also very dense. The denseness of the rock doesn't allow light to pass through it, therefore it appears dark in color. However, a very thing piece is almost transparent. Apache Tears (from Arizona) or Pele's tears (from Hawaii) are examples of thin pieces of obsidian. The picture at the left is of snowflale obsidian. Remember obsidian has no crystals. However, left long enough the obsidian will start to crystalize. The "snowflakes" are areas in the volcanic glass where microscopic crystals are forming.

INTRUSIVE IGNEOUS ROCKS Sometimes the molten rock cools before it reaches the surface. Molten rock that is still underground is called **magma**. Magma originates from the melting of the earth's crust and upper mantle. This melting occurs about a depth of 60 to 200 km. This molten rock is less dense than the solid rock, so it rises towards the surface. Molten rock that cools before it reaches the surface hardens to become **intrusive** igneous rock. Because it forms deep beneath the earth's surface, it has more time to cool and develops large crystals. Intrusive rocks include gabbro, diorite, and granite.

Diorite



GRANITE forms from granitic magma which is high in silicon and oxygen. The minerals which make-up granite are composed of silicon and oxygen. Granite has rather large crystals because the magma cooled-off very slowly underground.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